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Gyro Balanced Two Wheeler

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Abstract - *Our project deals with the design and the fabrication of the GYRO BALANCED TWO WHEELER. In developing countries, the increasing rate of urbanization and prevalence of motor vehicles is the principal cause of energy over-consumption, greenhouse gas emissions, and environmental deterioration. As a new type of transportation device, personal transporter may offer several potential benefits to solve current transportation-related problems. Balancing the personal transporter is a hard task. In this paper we design and develop a vehicle with stabilized mechanism. This transporter works on the principle of inverted pendulum.*

Key Words: Gyroscope, Gyroscopic Effect, Gimble Axle, Electronic Control Unit

1. INTRODUCTION

Gyro balanced two wheeler works on the principle of inverted pendulum and employs the use of electromechanical components which can be used as a means of transportation for a single person. It is a non-linear multivariable and naturally an unstable system. This paper presents a vehicle in which all components (mechanical, electrical and control) have been designed from ground up, produced, coupled together and tested. This vehicle can be viewed as ecological, battery operated and very easy to be used as system. The vehicle through an onboard-control system balances itself as well as responds to commands implied by the movement of the rider. The balancing of the vehicle can be done using inverted pendulum principle. An inverted pendulum is a pendulum which has its center of mass above its pivot point. It is often implemented with the pivot point mounted on a cart that can move horizontally and may be called a cart and pole whereas a normal pendulum is stable when hanging downwards, an inverted pendulum is inherently unstable, and must be actively balanced in order to remain upright. this can be done either by applying a torque at the pivot point, by moving the pivot point 3 horizontally as part of a feedback system, changing the rate of rotation of a mass mounted on the pendulum on an axis parallel to the pivot axis and thereby generating a net torque on the pendulum, or by oscillating the pivot point vertically. . As an example, we can consider a stick to be balanced by placing it vertically on the hand. If the stick tends to fall forward then we move our hand in the forward direction and vice-versa so that the stick does not fall down. In this paper the same principle is applied to balance the two wheeled vehicle.

2. LITERATURE REVIEW

- **Ching-Chih Tsai**, In this paper the design of prototype has been tested at different RPM of the disc and also with different weights to see that the vehicle is balancing. This report presents design and fabrication of the two-wheeler self-balancing vehicle which is capable of balancing itself under application of external forces and loads. The vehicle balances itself under various conditions like the forced tilt of the vehicle. Thus the proposed system can be much helpful for two-wheeled vehicles reducing accidents or unwanted falls and increasing safety to the rider. M. A. Johnson, and
- **AkshayKhot**, In this paper the prototype of a self-balanced gyroscopic vehicle is so designed that whenever an impact occurs on it, due to the production of the gyroscopic couple it gets stabilized. Once the motor starts rotating, the disc fitted on the motor shaft start rotating.

3. MAIN COMPONENTS REQUIRED

3.1 Frame:

This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grease.

3.2 DC Motor:

An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left hand rule. When a motor is in operation, it develops torque. This torque can produce mechanical rotation. DC motors are also like generators classified into shunt wound or series wound or compound wound motors.

Fig -3.2 DC Motor

3.3 Battery:

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern.

Fig -3.3 Battery

3.4 Bearing

The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel.

Fig -3.4 Bearing

3.5 Control Unit

In automotive electronics, Electronic Control Unit (ECU) is a generic term for any embedded system that controls one or more of the electrical system or subsystems in a motor vehicle. Types of ECU include Electronic/engine Control Module (ECM), Power train Control Module (PCM), Transmission Control Module (TCM), Brake Control Module (BCM or EBCM), Central Control Module (CCM), Central Timing Module (CTM), General Electronic Module (GEM), Body Control Module (BCM), Suspension Control Module (SCM), control unit, or control module.

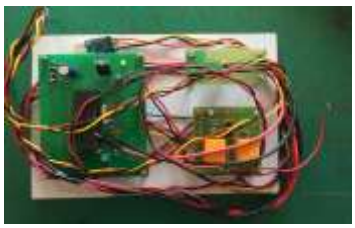

Fig -3.5 Control unit

3.6 Gyroscope

Rotation of the gyroscope leads to the production of the gyroscopic effect thus, when the wheels loose their balance due to the active gyroscopic couple a counter acting reactive gyroscopic couple is produced in the opposite direction due to gyroscopic effect thus stabilizing the prototype.

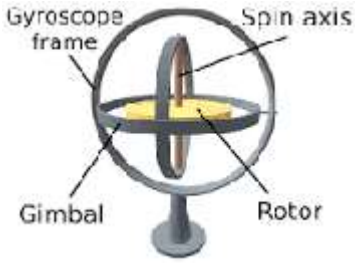

Fig -3.6 Gyroscope

4. WORKING

Once the motor starts rotating the gyroscope fitted on the motor shaft start rotating, the rotation of the gyroscope leads to the production of the gyroscopic effect (as mentioned for disc in introduction) thus, when the wheels loose their balance due to the active gyroscopic couple a counter acting reactive gyroscopic couple is produced in the opposite direction due to gyroscopic effect thus stabilizing the prototype, This occurs on both left as well as right hand side. Thus, due to rotation of the gyroscope a counteracting reactive gyroscopic couple leads to the stabilization of the prototype. The motor & gimble axle assembly is designed such a way that it is having heavy top. That means the center of gravity lies above the gimble axle. So the motor & gyroscope assembly tries to attain the position such that the C.G. of core will move downwards. But at the same time the motor & gimble assembly is arranged within the frame having bearing reaction at ends. So only possible way for motor to attain the stability is to either lean forward or backward. So when the motor is started the body is about to fall on either side & also the motor assembly is leaning this causes the precession of spin axis. Due to this precession, according to right hand rule the reactive gyroscopic couple acts on the frame which nullifies the effect of the disturbing couple & thus stabilizes the vehicle. After few rotations &

oscillations of motor, the motor & frame attains the stationary position and gyroscope is subjected to pure rolling motion about the spin axis.

5. ADVANTAGES

- They can make a much smaller stabilized system. They supply much greater stabilization per pound than inert counterweight.
- They have a "mystique" that impresses many people. If you shoot good images, the people paying the bill will think you are worth your pay.

6. CONCLUSION

A strong multidiscipline team with a good engineering base is necessary for the Development and refinement of advanced computer programming, editing techniques, diagnostic Software, algorithms for the dynamic exchange of informational different levels of hierarchy. This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We are proud that we have completed the work with the limited time successfully. The **"GYRO BALANCED TWO WHEELER"** is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work. Thus we have developed a **"GYRO BALANCED TWO WHEELER"**. By using more techniques, they can be modified and developed according to the applications.

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